FORMAT 1

Submit original with signatures + 1 copy + electronic copy to Faculty Senate (Box 7500).

See http://www.uaf.edu/uafgov/faculty-senate/curriculum/course-degree-procedures-/ for a complete description of the rules governing curriculum & course changes.

TRIAL COURSE OR NEW COURSE PROPOSAL
(Attach copy of syllabus)

SUBMITTED BY:

Department	**Chemistry and Biochemistry**	**College/School**	**CNSM**
Prepared by	**Sarah Hayes**	**Phone**	**907-474-7118**
Email Contact	**s.hayes@alaska.edu**	**Faculty Contact**	**Sarah Hayes**

1. ACTION DESIRED (CHECK ONE): Trial Course: X | New Course:

2. COURSE IDENTIFICATION: Dept: **CHEM** | Course #: **194** | No. of Credits: **3**

Justify upper/lower division status & number of credits: **This course is designed to introduce entry-level undergraduates to environmental chemistry. The course will consist of 2 hours of lecture and 3 hours lab per week.**

3. PROPOSED COURSE TITLE: **Introduction to Environmental Chemistry of the Arctic**

4. To be CROSS LISTED? *YES/NO*: **no** | If yes, Dept: | Course #:

NOTE: Cross-listing requires approval of both departments and deans involved. Add lines at end of form for additional required signatures.

5. To be STACKED?* *YES/NO*: **no** | If yes, Dept. | Course #:

How will the two course levels differ from each other? How will each be taught at the appropriate level?:

* Use only one Format 1 form for the stacked course (not one for each level of the course!) and attach syllabi. Stacked course applications are reviewed by the (Undergraduate) Curricular Review Committee and by the Graduate Academic and Advising Committee. Creating two different syllabi (undergraduate and graduate versions) will help emphasize the different qualities of what are supposed to be two different courses. The committees will determine: 1) whether the two versions are sufficiently different (i.e. is there undergraduate and graduate level content being offered); 2) are undergraduates being overtaxed?; 3) are graduate students being undertaxed? In this context, the committees are looking out for the interests of the students taking the course. Typically, if either committee has qualms, they both do. More info online – see URL at top of this page.

6. FREQUENCY OF OFFERING: **Fall**

Fall, Spring, Summer (Every, or Even-numbered Years, or Odd-numbered Years) — or As Demand Warrants

7. SEMESTER & YEAR OF FIRST OFFERING (Effective AY2015-16 if approved by 3/31/2015; otherwise AY2016-17): **AY 2015-16 or Fall 2015**

8. COURSE FORMAT:

NOTE: Course hours may not be compressed into fewer than three days per credit. Any course compressed into fewer than six weeks must be approved by the college or school's curriculum council. Furthermore, **any core course compressed to less than six weeks must be approved by the Core Review Committee**.

COURSE FORMAT: (check all that apply)		*1*		*2*		*3*		*4*		*5*	X	*6 weeks to full semester*
OTHER FORMAT (specify)												
Mode of delivery (specify lecture, field trips, labs, etc)	**2 hour lecture, 3 hours lab per week**											

9. CONTACT HOURS PER WEEK: **2** LECTURE hours/weeks | **3** LAB hours /week | PRACTICUM hours /week

Note: # of credits are based on contact hours. 800 minutes of lecture=1 credit. 2400 minutes of lab in a science course=1 credit. 1600 minutes in non-science lab=1 credit. 2400-4800 minutes of practicum=1 credit. 2400-8000 minutes of internship=1 credit. This must match with the syllabus. See http://www.uaf.edu/uafgov/faculty-senate/curriculum/course-degree-procedures-/guidelines-for-computing-/ for more information on number of credits.

OTHER HOURS (specify type):

10. COMPLETE CATALOG DESCRIPTION including dept., number, title, credits, credit distribution, cross-listings and/or stacking (50 words or less if possible):

Example of a complete description:

FISH F487 W, O Fisheries Management
3 Credits Offered Spring
Theory and practice of fisheries management, with an emphasis on strategies utilized for the management of freshwater and marine fisheries. *Prerequisites: COMM F131X or COMM F141X; ENGL F111X; ENGL F211X or ENGL F213X; ENGL F414; FISH F425; or permission of instructor.* Cross-listed with NRM F487. (3+0)

CHEM 194 Introduction to Environmental Chemistry of the Arctic
3 Credits Offered Fall
This course introduces students to environmental chemistry through investigating the air, water, and soil quality of the arctic environment as affected by natural and anthropogenic cycling of nutrients and contaminants. The lab component will focus on characterization of natural waters collected around the state.
Pre-requisites: none

11. COURSE CLASSIFICATIONS: Undergraduate courses only. Consult with CLA Curriculum Council to apply S or H classification appropriately; otherwise leave fields blank.

H = Humanities		S = Social Sciences	

Will this course be used to fulfill a requirement for the baccalaureate core? **If YES, attach form.**	**YES:**		**NO:**	X

IF YES, check which core requirements it could be used to fulfill:

O = Oral Intensive, **Format 6**		W = Writing Intensive, **Format 7**		X = Baccalaureate Core	

11.A Is course content related to northern, arctic or circumpolar studies? If yes, a "snowflake" symbol will be added in the printed Catalog, and flagged in Banner.

YES	X	NO	

12. COURSE REPEATABILITY:

Is this course repeatable for credit?	**YES**		**NO**	X

Justification: Indicate why the course can be repeated (for example, the course follows a different theme each time).	

How many times may the course be repeated for credit?		**TIMES**
If the course can be repeated for credit, what is the maximum number of credit hours that may be earned for this course?		**CREDITS**
If the course can be repeated with variable credit, what is the maximum number of credit hours that may be earned for this course?		**CREDITS**

13. GRADING SYSTEM: Specify only one. Note: Changing the grading system for a course later on constitutes a Major Course Change – Format 2 form.

LETTER:	X	**PASS/FAIL:**	

RESTRICTIONS ON ENROLLMENT (if any)

14. PREREQUISITES	**none**

These will be *required* before the student is allowed to enroll in the course.

15. SPECIAL RESTRICTIONS, CONDITIONS	**none**

16. PROPOSED COURSE FEES	**$100 on campus, $250 off campus**
Has a memo been submitted through your dean to the Provost for fee approval? **Yes/No**	**yes**

17. PREVIOUS HISTORY

Has the course been offered as special topics or trial course previously? **Yes/No**	**no**
If yes, give semester, year, course #, etc.:	

18. ESTIMATED IMPACT

WHAT IMPACT, IF ANY, WILL THIS HAVE ON BUDGET, FACILITIES/SPACE, FACULTY, ETC.

This course requires 3 credits of workload for the instructing faculty. The currently proposed model is to team teach this course between 3 faculty (Hayes, Iceman, Guerard) for 1 credit each.

19. LIBRARY COLLECTIONS

Have you contacted the library collection development officer (kljensen@alaska.edu, 474-6695) with regard to the adequacy of library/media collections, equipment, and services available for the proposed course? If so, give date of contact and resolution. If not, explain why not.

No	X	Yes		**Current library collection is adequate for the course.**

20. IMPACTS ON PROGRAMS/DEPTS

What programs/departments will be affected by this proposed action?
Include information on the Programs/Departments contacted (e.g., email, memo)

The Department of Chemistry and Biochemistry will be the primary affected program.

The first offering of this course will have substantial financial support. This includes funding for a dedicated TA-ship in Fall 2015.

Hayes and Iceman are CITE fellows and developing this course in close collaboration with eLearning is Hayes' CITE project. This means that Elearning offers substantial support regarding the development, design, and implementation of the course. Their role will be to assist in distance delivery as well as integration of the distance and in person classroom. We have also established industrial partnerships that will support the development of distance delivery lab modules.

21. POSITIVE AND NEGATIVE IMPACTS

*Please specify **positive and negative** impacts on other courses, programs and departments resulting from the proposed action.*

UAF does not currently offer any specific environmental chemistry courses at the entry or mid-career levels, despite having one of the few Environmental Chemistry graduate programs in the country. This course will likely help recruit chemistry majors. Additionally, this course will build a cohort of students that could support rural students in coming to UAF to finish their professional training.

JUSTIFICATION FOR ACTION REQUESTED

The purpose of the department and campus-wide curriculum committees is to scrutinize course change and new course applications to make sure that the quality of UAF education is not lowered as a result of the proposed change. Please address this in your response. This section needs to be self-explanatory. Use as much space as needed to fully justify the proposed course.

This course will be offered as a combination on-campus and distance model and provide the opportunity for all students to be exposed to environmental chemistry (UAF does not currently offer any specific environmental chemistry courses at the entry or mid-career levels, despite having one of the few Environmental Chemistry graduate programs in the country). This course will hopefully help recruit chemistry majors as well as building a cohort that will support rural students in coming to UAF to finish their professional training.

APPROVALS: Add additional signature lines as needed.

Signature, Chair, Program/Department of: Chem / Biochem	Date	2-4-15
Signature, Chair, College/School Curriculum Council for: CNSM	Date	2-4-15
Signature, Dean, College/School of: CNSM	Date	2/7/15

Offerings above the level of approved programs must be approved in advance by the Provost.

Signature of Provost (if above level of approved programs)	Date	

ALL SIGNATURES MUST BE OBTAINED PRIOR TO SUBMISSION TO THE GOVERNANCE OFFICE

Signature, Chair	Date	

Faculty Senate Review Committee: ___Curriculum Review ___GAAC

___Core Review ___SADAC

ADDITIONAL SIGNATURES: (As needed for cross-listing and/or stacking)

Signature, Chair, Program/Department of:	Date	
Signature, Chair, College/School Curriculum Council for:	Date	
Signature, Dean, College/School of:	Date	

ATTACH COMPLETE SYLLABUS (as part of this application). This list is online at:
http://www.uaf.edu/uafgov/faculty-senate/curriculum/course-degree-procedures-/uaf-syllabus-requirements/
The Faculty Senate curriculum committees will review the syllabus to ensure that each of the items listed below are included. If items are missing or unclear, the proposed course (or changes to it) may be denied.

SYLLABUS CHECKLIST FOR ALL UAF COURSES
During the first week of class, instructors will distribute a course syllabus. Although modifications may be made throughout the semester, this document will contain the following information (as applicable to the discipline):

1. Course information:
❑Title, ❑ number, ❑credits, ❑prerequisites, ❑ location, ❑ meeting time (make sure that contact hours are in line with credits).

2. Instructor (and if applicable, Teaching Assistant) information:
❑ Name, ❑ office location, ❑ office hours, ❑ telephone, ❑ email address.

3. Course readings/materials:
❑ Course textbook title, ❑ author, ❑ edition/publisher.
❑ Supplementary readings (indicate whether ❑ required or ❑ recommended) and
❑ any supplies required.

4. Course description:
❑ Content of the course and how it fits into the broader curriculum;
❑ Expected proficiencies required to undertake the course, if applicable.
❑ Inclusion of catalog description is *strongly* recommended, and
❑ Description in syllabus must be consistent with catalog course description.

5. ❑ Course Goals (general), and (see #6)

6. ❑ Student Learning Outcomes (more specific)

7. Instructional methods:
❑ Describe the teaching techniques (eg: lecture, case study, small group discussion, private instruction, studio instruction, values clarification, games, journal writing, use of Blackboard, audio/video conferencing, etc.).

8. Course calendar:
❑ A schedule of class topics and assignments must be included. Be specific so that it is clear that the instructor has thought this through and will not be making it up on the fly (e.g. it is not adequate to say "lab". Instead, give each lab a title that describes its content). You may call the outline Tentative or Work in Progress to allow for modifications during the semester.

9. Course policies:
❑ Specify course rules, including your policies on attendance, tardiness, class participation, make-up exams, and plagiarism/academic integrity.

10. Evaluation:
❑ Specify how students will be evaluated, ❑ what factors will be included, ❑ their relative value, and ❑ how they will be tabulated into grades (on a curve, absolute scores, etc.) ❑ Publicize UAF regulations with regard to the grades of "C" and below as applicable to this course. (Not required in the syllabus, but is a convenient way to publicize this.) Link to PDF summary of grading policy for "C":
http://www.uaf.edu/files/uafgov/Info-to-Publicize-C_Grading-Policy-UPDATED-May-2013.pdf

11. Support Services:
❑ Describe the student support services such as tutoring (local and/or regional) appropriate for the course.

12. Disabilities Services: Note that the phone# and location have been **updated.** http://www.uaf.edu/disability/ The Office of Disability Services implements the Americans with Disabilities Act (ADA), and ensures that UAF students have equal access to the campus and course materials.

❑ State that you will work with the Office of Disabilities Services (208 WHITAKER BLDG, 474-5655)to provide reasonable accommodation to students with disabilities.

TITLE:	Introduction to Environmental Chemistry of the Arctic
NUMBER:	CHEM 194
CREDITS:	3
PREREQUISITES:	None
LOCATION:	TBD
MEETING TIME:	On Campus: 2hr Lecture, 3hr lab/wk Distance: Remotely attend 2 hr synchronous lecture via Google Hangouts or watch lectures asynchronously. Lab experiments and collaboration performed asynchronously.

Instructors:	Dr. Sarah Hayes	Dr. Jennifer Guerard	Dr. Chris Iceman
Office:	Reichardt 188	Reichardt 180	Reichardt 182
Phone:	907-474-7118	907-474-5231	907-474-6610
Email:	s.hayes @alaska.edu	jguerard@alaska.edu	criceman@alaska.edu
Office Hours:	TBD, or by appointment.		

COURSE DESCRIPTION

This course introduces students to environmental chemistry through investigating the air, water, and soil quality of the arctic environment as affected by natural and anthropogenic cycling of nutrients and contaminants. The lab component will focus on characterization of natural waters collected around the state. Pre-requisites: none

EXPANDED COURSE DESCRIPTION

This course introduces students to environmental chemistry through investigating the air, water, and soil quality of the arctic environment as affected by natural and anthropogenic cycling of nutrients and contaminants. The lab component will focus on characterization of natural waters collected around the state through the use of collaborative teams, made of a combination of distance and on-campus students. These students will generally have the same lab experiences, but at some points in the semester, there will be divergent activities between the on-campus and distance students dictated by the needs of the research teams.

Within each research team, the distance students will be the site experts while the on-campus students will be instrumentation experts, thereby strengthening the team. Distance students will have the opportunity to share their field sites with their on-campus team through photos and videos but maintain an inherently better understanding of their unique sampling sites. While on-campus students will be part of a more interactive experience with advanced instrumentation because they will have a tour with the TA operating the instruments. Distance students may also be part of this tour, but all students will also have the opportunity to learn asynchronously through virtual tours. In all cases, students will be provided with equivalent opportunities.

COURSE GOALS

Students will appreciate the influence of chemistry in their natural, arctic environment and the human-caused perturbations of these systems.

STUDENT LEARNING OUTCOMES

Upon successful completion of this course, students will:

- Outline basic metrics for assessing air, water, and soil quality as indicators of environmental health.

- Identify examples of anthropogenic influences of natural cycles and explain how that impacts ecosystem health.
- Evaluate student-generated water quality data from across the state and interpret data to assess anthropogenic perturbation of ecosystems.

COURSE READINGS/MATERIALS

Required readings are available on Blackboard or on course website. Distance students must purchase and receive lab kits by week 2.

TECHNICAL REQUIREMENTS FOR COURSE

Students must have regular access to a computer and the Internet to access online materials in Blackboard. Students will be expected to download course material as well as upload assignments. Students are also expected to regularly use their UAF Gmail accounts, Google Hangouts, and learn to use Wordpress as a method of collaboration and sharing of their understanding.

INSTRUCTIONAL METHODS

Course material will be delivered through a combination of lectures incorporating active learning techniques and weekly activities (ie case studies, interviews with experts, etc). Groups of on campus and distance students (2 on campus for every distance student at max enrollment) will generate lab-based replicate data sets of surface water quality data from communities across the state. Student groups will work closely and engage in peer mentoring (distance student is the place-based expert while on campus students will become instrumentation experts) and build a community of learners across the state of Alaska.

COURSE SCHEDULE

See attached.

COURSE POLICIES

Continued attendance to class indicates each student agrees to the policies set forth in this syllabus. Distance course attendance will be measured through effort on assignments, collaborative activities, and exams.

Collaboration and Classroom Behavior - Collaboration and working in small groups is a key component of classroom and lab time. Your group is there to support your learning, not do the work for you. Students are expected to conduct themselves in a professional manner at all times. Disrespect of the classroom learning environment, instructors, and fellow students will not be tolerated!

Late work- Assignments will be due at 11:59pm. Late work will be accepted at a 10% per day reduction of the points possible. This is in an effort to keep the entire class moving through the projects efficiently. Emergency situations will be dealt with as needed.

Instructor-Initiated Withdrawals- Any time up to and including the last day to drop with a "W", the professor has the right to withdraw a student that "...has not participated substantially in the course." In CHEM 194 nonparticipation includes:
(1) Either of the first two assignments are not turned in within 1 week of the due date,
(2) Exam I is missed without an excused absence,

(3) one or more lab reports are not turned in within 1 week of the date due, or
(4) completes less than 2/3 of homework assignments.

EVALUATION POLICIES

There are **1000 total points available** in this class. Grades are assigned as follows: 1000-900 A, 900-800 B, 800-700 C, etc. Grades are assigned on the typical scale 90-100 A, 80-90 B, 70-80 C, etc. the instructor reserves the right to adjust grading scheme to the student's benefit.

Hour exams	2 x 100 pts	200
Homework	15 pts x 15 weeks= 225 points possible	200
In-class activities & Quizzes	20pts x ~20 assignments= 200 points possible	180
Labs	14 x 30 pts	420
Total points		1000

Exams- Two hourly exams are scheduled, a midterm and final exam. For distance students, UAF eLearning will contact you regarding proctored exams. More information will be given to distance students after enrollment.
Homework- Weekly online homework assignments will be due each Wednesday.
In-class activities and Quizzes- Class participation will be assessed weekly using in-class activities (case studies, worksheets, interviews with experts, etc) and a few quizzes. All students are expected to participate in blog discussion of case studies, and interviews.
Labs- Fourteen weeks of lab experiments will be performed during the semester, each worth 30 points. Collaborative and individual lab reports will be exchanged between students and the instructor using student UAF google drive.

Successful, timely completion of this course depends on committing yourself early and maintaining your effort. To this end, this course adheres to the following UAF eLearning Procedures:

1. The first contact assignment (Introduction) is due one week after the first day of instruction. *Failure to submit this assignment within the first two weeks of the course could result in withdrawal from the course.*
2. The first content assignment (Lesson 1) is due one week after the first day of instruction. *Failure to submit this assignment within the first two weeks of the course could result in withdrawal from the course.*
3. *Failure to submit the first three content assignments (Assignments 1, 2 and 3) by the deadline for faculty-initiated withdrawals (the ninth Friday after the first day of classes) could result* ***in instructor initiated withdrawal from the course (W****).*

INSTRUCTOR RESPONSE TIME

The instructors will attempt to respond promptly to student emails during normal business hours, but response times may be up to 24 hours. Assignments graded by instructors (e.g., lab reports, exams, blog posts) will generally be returned within 48 hours after assignment due date but no longer than a week. Grades in Blackboard will be updated weekly.

HOW TO CHECK YOUR GRADE

To check your grades for assignments and find comments from your instructor, click on the My Grades link in the sidebar menu in Blackboard. All the assignments and their due dates are listed. If your instructor has left comments, there will be a Comments link. Click on this link to view comments.

If the score is for a test or quiz, click on the check mark or your score to see results and feedback.

If the score is for an assignment, the title of the assignment is a link and by clicking this link you'll be taken to your submission, grade and comments.

If you see a green explanation point, your assignment has not been graded yet.

EFFORT AND STUDENT INVOLVEMENT
The categories below demonstrate how the 3 hours of lecture and 6 hours of non-lecture in a face to face course translate into 9 hours of work in an online course, meeting the requirement of 9 hours of work per week for a 3 credit course. This calculation covers the entire course.

1. **INSTRUCTION:** lecture/ readings *10%*
2. **INDIVIDUAL RESEARCH** *lab experiments 20%*
3. **ASSIGNMENTS** *case studies, quizzes, homework, exams 30%*
4. **COLLABORATION** *case studies, laboratory project 40%*

EXPECTATION OF STUDENT EFFORT
Students should expect to spend 10-12 hours per week on this class. Students are expected to complete the weekly assignments by their due dates.
If circumstances arise that cause you to need extra time on any assignment(s), e-mail your instructor for guidance. Extensions of due dates may be granted, but your instructor expects to be informed in advance if you are not able to submit your assignment on time. () Students are expected to maintain a working backup plan to be implemented in the event of a computer malfunction or an interruption of their normal Internet service during the course.

ACADEMIC INTEGRITY

Honor code and Academic integrity- Students are expected to conduct themselves in accordance with the UAF Honor code. The Chemistry Department policy states: *Any student caught cheating will be assigned a course grade of F. The students' academic advisor will be notified of this failing grade and the student will not be allowed to drop the course.*

As described by UAF, scholastic dishonesty constitutes a violation of the university rules and regulations and is punishable according to the procedures outlined by UAF. Scholastic dishonesty includes, but is not limited to, cheating on an exam, plagiarism, and collusion. Cheating includes providing answers to or taking answers from another student. Plagiarism includes use of another author's words or arguments without attribution. Collusion includes unauthorized collaboration with another person in preparing written work for fulfillment of any course requirement. Scholastic dishonesty is punishable by removal from the course and a grade of "F." For more information go to Student Code of Conduct. (http://uaf.edu/usa/student-resources/conduct)

SUPPORT SERVICES
UAF eLearning Student Services helps students with registration and course schedules, provides information about lessons and student records, assists with the examination process, and answers general questions. Our Academic Advisor can help students communicate with instructors, locate helpful resources, and maximize their distance learning experience. Contact the UAF eLearning Student Services staff at 907. 479.3444 or toll free 1.800.277.8060 or contact staff directly – for directory listing see: http://elearning.uaf.edu/contact

UAF Help Desk
Go to http://www.alaska.edu/oit/ to see about current network outages and news.
Reach the Help Desk at:

- e-mail at helpdesk@alaska.edu
- fax: 907.450.8312
- phone: 450.8300 (in the Fairbanks area) or 1.800.478.8226 (outside of Fairbanks)

DISABILITIES SERVICES - The **UAF Office of Disability Services** operates in conjunction with UAF eLearning. Disability Services, a part of UAF's Center for Health and Counseling, provides academic accommodations to enrolled students who are identified as being eligible for these services.

If you believe you are eligible, please visit their web site (http://www.uaf.edu/disability/) or contact a student affairs staff person at your local campus. You can also contact Disability Services on the Fairbanks campus by phone, 907.474.5655, or by e-mail (uaf-disabilityservices@alaska.edu).

VETERAN SUPPORT SERVICES - Walter Crary (wecrary@alaska.edu)is the Veterans Service Officer at the Veterans Resource Center (111 Eielson Building, 474-2475). Fairbanks Vet Center 456-4238. VA Community Based Outpatient Clinic at Ft. Wainwright is 361-6370.

B. Tentative Lecture and Lab Schedule

C. Week 1 - Introduction

Environmental science connection between health of ecosystems, animals, and communities types of contaminants and how we will look for them in lab. History of environmental monitoring and activism (*Silent Spring*, silent snow, living downstream, etc).
Case study: Silent Spring excerpt by Rachel Carson, history of the environmental science movement

Lab 1: Safety and Scientific Method

- Get kit and unpack it
- EscienceLabs scientific method exercise

D. Week 2 – Air Quality

Air quality intro and description, ozone, volcano eruptions, distal transport of contaminants to the Arctic (Grasshopper Effect)
Case study: Silent Snow from… I gotta look this up I saw a talk at the March 2012 ACS about this

Lab 2: Air Quality Experiments

- HiSplit Lagrangian modeling of forecasting and backcasting volcanic plumes

E. Week 3: Introduction to Water Quality

Water cycle, field-sampling techniques, legacy and emerging contaminants
Case study: Tricolsan in water treatment – from research to regulation in Minnesota

Lab 3: Drinking Water Analysis

- Distance students - Plan water sampling and test probes (pH, DO, EC, etc.)
  On-campus students - alkalinity titration using tap and DI water
- Escience Labs – water treatment and drinking water quality – amend to include activated carbon

Week 4: Water Quality and Treatment

Basic modes of treatment/remediation techniques and measures of water quality parameters
Case study: Interview with CH2M Hill professionals

Lab 4: Natural Water Sampling & Analysis:

- All students: Record time, date, location lat/long, temperature, take several pictures of the site, use probe to record temperature, pH, EC, DO, turbidity
- Condition and fill three 500 mL bottles of water
- Distance students: Immediately at home: place samples in fridge, take photos of water samples against a white background
  On-campus students: Immediately place samples in lab fridge, take photos of water sample against a white background
- Distance students: Prepare water samples for shipping to UAF. From each replicate 500 mL sample:
  - Filter 15 ml water 0.45 um for anions- tube needs to be prepared by rinsing w DI
  - Filter 15 ml water 0.45 um and acidify for metals- tube needs to be prepared by acid wash
  - Filter 50 ml falcon tube

On-campus students – Prepare to receive water samples, work with TA to run lab analyses on collected samples (anions by IC, cations by ICP-MS, nutrients by TOC)

Week 5 – Contaminant transport and transformation

Contaminant transport mechanisms and degradation processes. Introduction to abiotic and biotic transformations.

Case study: PCBs in salmon causing accumulation in spawning lake sediments
http://sciencecases.lib.buffalo.edu/cs/collection/detail.asp?case_id=191&id=191

Lab 5: Computational modeling of contaminant partitioning

- Using quantum chemistry to compute partitioning parameters of model contaminants from aqueous into a lipid bilayer phase – introduction to Log K_{ow}

Week 6 – Stream flow and bioindicators of water quality
Instruction to using tracers to measure stream flow, bioindicators such as identification of insect species in differing levels of pollution
Case study: Stream amphibians as bioindicators in California's Redwoods: Welsh and Olliver, Ecological Applications, 1998, 8:4, 1118-1132.

Lab 6: Stream dynamics

- Escience Labs - building a stream and measuring flow
- Develop virtual lab to investigate different species of water quality bioindicator species

F. Week 7: Marine water quality

Ocean acidification, petroleum spill remediation techniques, salinity, plastics in the ocean
Case study: Ocean acidification causes bleaching and productivity loss in coral reef builders, PNAS, 2008, 105:45, 17442-17446.

Lab 7 – Testing effect of ocean acidification

- CO_2 bubbling (breath) and measuring pH changes as a function of salinity

Week 8 – Aquatic microbial biodiversity
Types of planktonic and self-mobilized microbes in freshwaters, from bacteria to algae and diatoms, up to rotifers and daphnia
Case study: Coliforms in Antarctica
http://sciencecases.lib.buffalo.edu/cs/collection/detail.asp?case_id=330&id=330

Lab 8: Investigating the microscopic world

- Esciencelab- virtual magnification
- Esciencelab- virtual microscope- modify to focus on cytometry
- Return to field site: Record time, date, location lat/long, temperature, take several pictures of the site, use probe to record temperature, pH, EC, DO, turbidity
    - Utilize tablets (Kindle Fire?) and camera adapter to investigate microbial activity in sampled waters. Observe microbiota, use tablet to screen shot images observed with microscope tool.
    - Send data to UAF for compilation

Week 9 – Soil Quality
Geology and soil development within Alaska, permafrost degradation, landscape formation (braided rivers, mass transport by wind and water).
Case study- Organic farming in the artic- have Calypso or Cripple Creek Organics speak

Lab 9: Soil quality and contamination

- Esciencelab- soil porosity
- Esciencelab- chemical properties of soil
- Esciencelab- soil contamination

Week 10 – Metals and Inorganic contaminants

Toxic metals and redox states, acid mine drainage, groundwater contamination (e.g., As, Sb)
Case study – Pebble mine: Tension between mineral recovery, subsistence and commercial fishing, and community health

Lab 10: Metals analysis

- Esciencelab- effects of groundwater contamination
- Esciencelab- acid mine drainage and natural metals
- Fe^{2+}/Fe^{3+} speciation using ferrozine method on water samples - using tablet with spectrometer adaptor. Kit would include standards to generate a calibration curve

G. Week 11 – Environmental Microbiology in Soils

Biological degradation mechanisms of contaminants
Case study – Oil Biodegradation and Bioremediation: A Tale of the Two Worst Spills in US History (Exxon Valdez, BP Gulfwater Horizon), Environmental Science & Technology, 2011, 45:16, 6709-6715.

Lab 11: Bacterial diversity in soils

- Esciencelab- Bacterial isolation from soil samples
- Esciencelab- Characterizing bacteria isolated from soil
- Esciencelab- Winogradsky column

Week 12 – Food webs and Bioaccumulation

Survey of ecosystems in Alaska, food web interactions in the Arctic, biomagnification
Case study: Tuna for lunch? Bioaccumulation of Hg
http://sciencecases.lib.buffalo.edu/cs/collection/detail.asp?case_id=549&id=549
Case study: review Todd O'Hara's work.

Lab 12: Ecology of organisms

- Esciencelab- Yeast response to pollution
- Esciencelab- Ecological interactions, biomagnification

H. Week 13 –Forest Fires & Ecological Succession

Phases of primary and secondary succession – coastal rainforests, boreal forests, tundra, progressive vs. regressive succession
Case study: Primary succession following deglaciation at Glacier Bay, Alaska – Chapin et al., Ecological Monographs, 1994 (64:2), 149-175

Lab 13: Sharing project data

Peer research project presentations, peer evaluations

Week 14 - Climate Change in the Arctic

Principles of climate change, influence of sea ice albedo and positive feedback mechanisms, glacier melt
Case study: Permafrost and subsidence in the Arctic

Lab 14:

- Esciencelab - solar energy budget calculations and greenhouse effect
- Working with peers to prepare for presentations

Week 15 – Peer Research Presentations, Story GIS Project

Sharing TA synthesis of whole dataset with students and discuss how this could be helpful to their communities

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To: Susan Henrichs, Provost

Through: Paul Layer, CNSM Dean

Through: Tom Green, Department Head Chemistry and Biochemistry

From: Sarah Hayes

Date: December 11, 2014

Regarding: Justification of $100 on campus, $250 distance students lab fee for proposed CHEM 194
Detail Code: FCH1

This memo is justifying the lab fees charged to students enrolled in CHEM 194 Introduction to Environmental Chemistry of the Artic, a lab-based course that will be offered by both a distance and on-campus model. The lab-based portion of this course will focus on characterization of surface water quality of samples collected in student communities from across the state collected by distance students. Three replicate samples will be collected and two of these will be sent to UAF for replicate analysis by on campus students as well as analysis using instrumentation available at UAF. Distance students in this course will be required to purchase a lab kit (average cost $250 from esciencelabs.com) developed specifically for the course. On campus students will be charged $100 to cover the cost of instrumentation, instrument consumables, and lab supplies for labs performed by on-campus students.

Most instrumentation required for characterizing surface waters is owned communally within the department (IC, TOC/TIC/TN, UV-Vis, Fluorimeter) and are available for use for the cost of consumables and reagents (estimated at $10 per student at max enrollment of 20). ICP-MS trace metals analysis is an essential component of surface water quality, is available through the Advanced Instrumentation Laboratory for an hourly cost of $50 and an estimated 2 days is required ($800 per semester, roughly $40 per student). I estimate the costs for reagents and consumables in this course required to execute the undergraduate-planned experiments to be $50 per student.